Cornell University

Follow the Sun through the Clouds: Application Migration for Geographically Shifting Workloads

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Supercloud Demo

VM

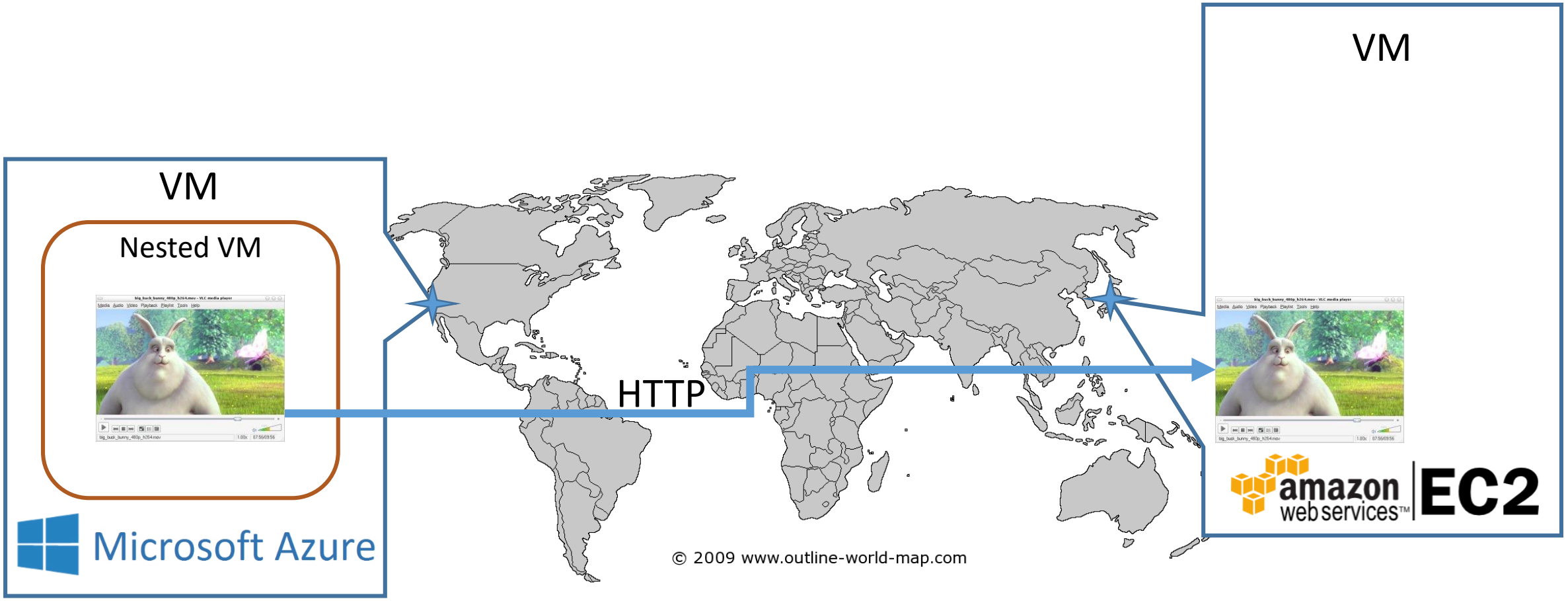
Nested VM

Microsoft Azure

VM

amazon web services™ EC2

Supercloud Demo

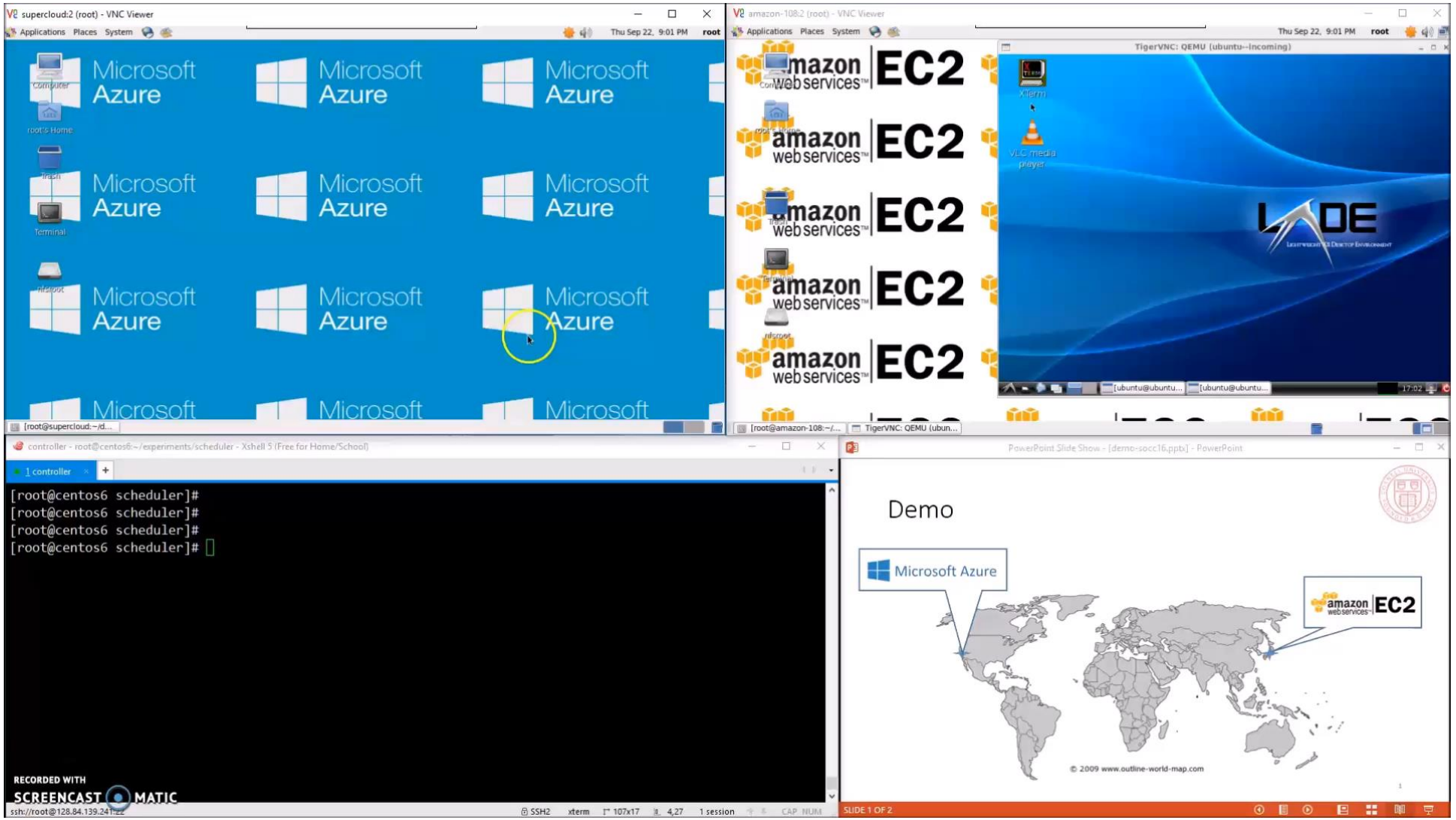


Supercloud Demo

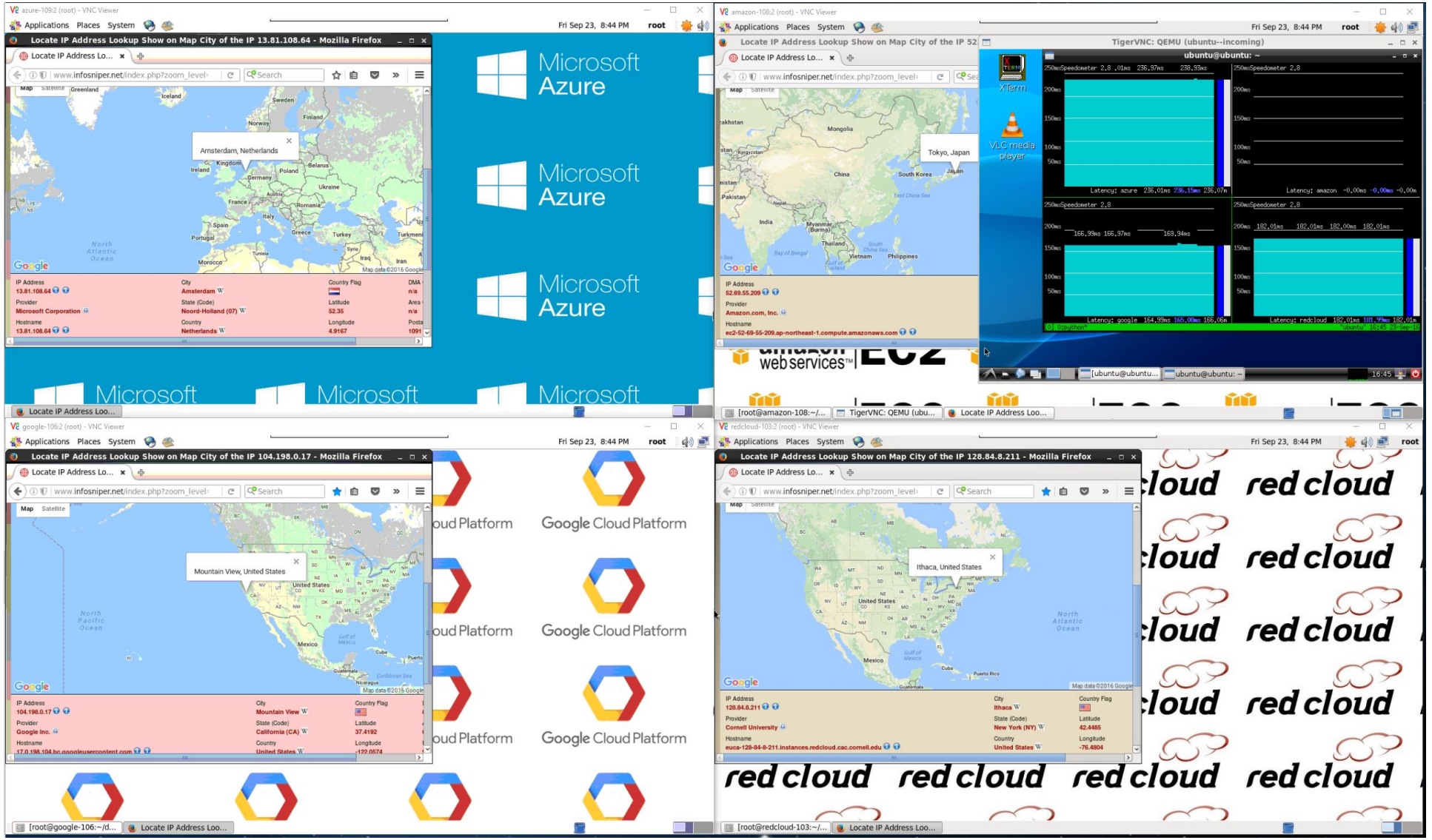
Highlights

- Automatic VM placement and migration
- Migrated VMs are LIVE
- IP addresses are not changed
- TCP connections are not broken

Demo (Full video available at http://supercloud.cs.cornell.edu)



Full Demo (http://supercloud.cs.cornell.edu)



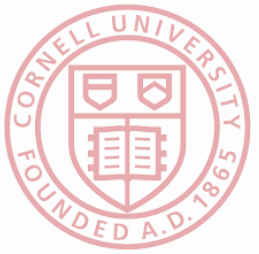
Highlights

- Automatic VM placement and migration
- Migrated VMs are LIVE
- IP addresses are not changed
- TCP connections are not broken

- Appears as a unified private cloud that spans all clouds
- Controlled by the user!

Research Challenges

- How to migrate across incompatible virtualization platforms?
- How to keep IP addresses unchanged and TCP connections unbroken?
- How to decide when and where to migrate?
- How to make the system efficient?



Supercloud is the first system that supports

automatic,

efficient,

and live

VM migration

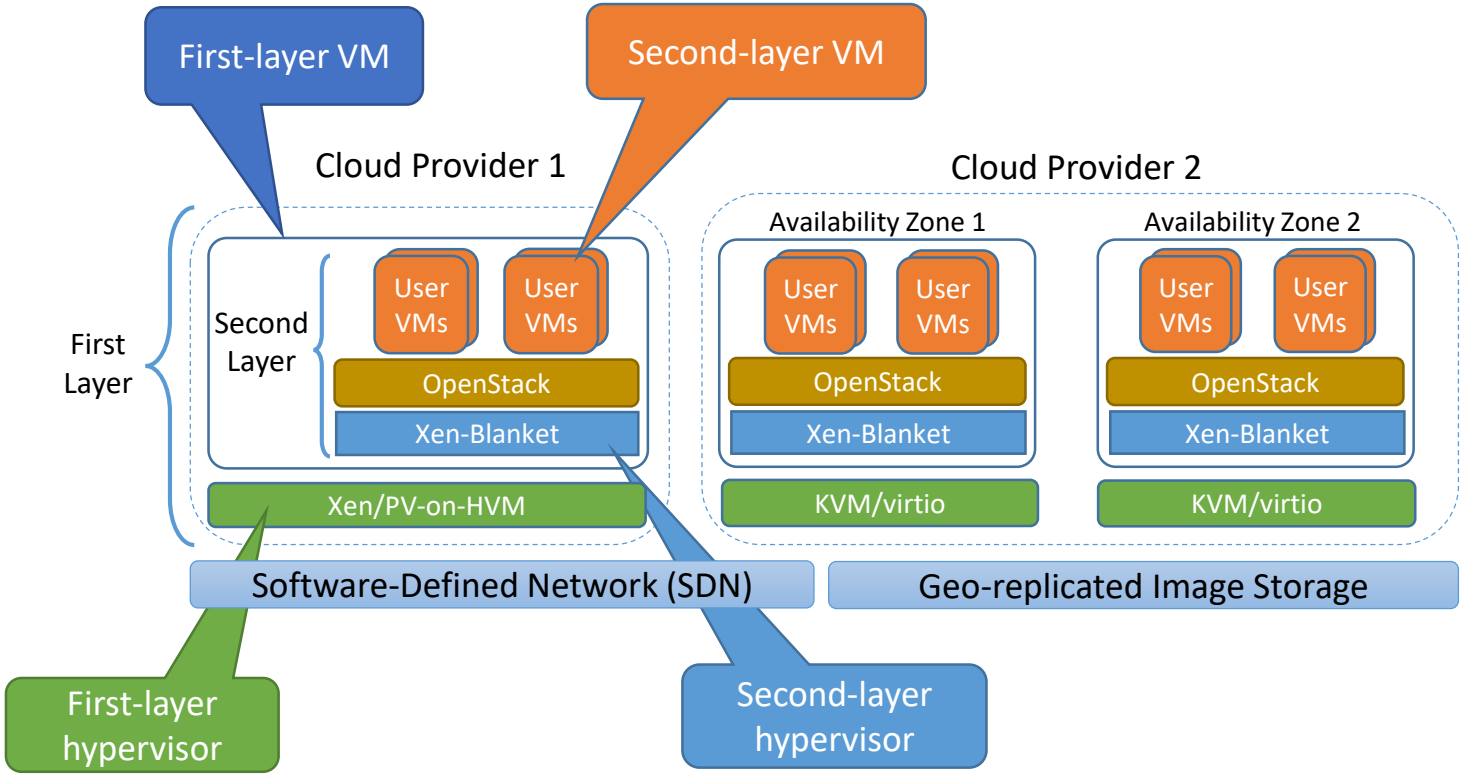
across heterogeneous cloud providers

without changing IP addresses

or breaking TCP connections.

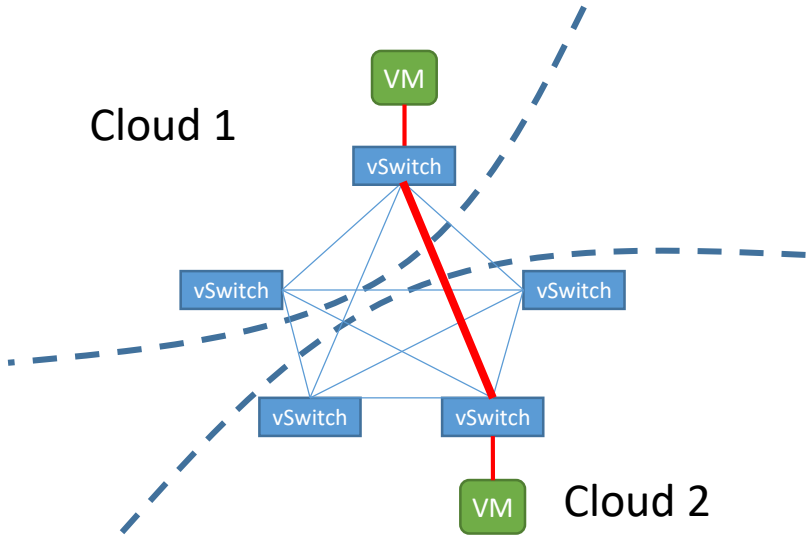
Supercloud Architecture

- Computation
  - Nested hypervisor: Xen-Blanket
  - Support all major platforms
- Network
  - SDN overlay
  - Support migration with public IP
- Storage:
  - Geo-replicated storage
  - Optimized for serving VM images
- Resource management
  - OpenStack platform
  - Automatic scheduling framework



Supercloud Networking

- Challenges:
  - Optimal routing without extra forwarding
  - Migration without changing IP addresses
- Solution:
  - VPN overlay with full-mesh tunnels
  - Frenetic SDN controller



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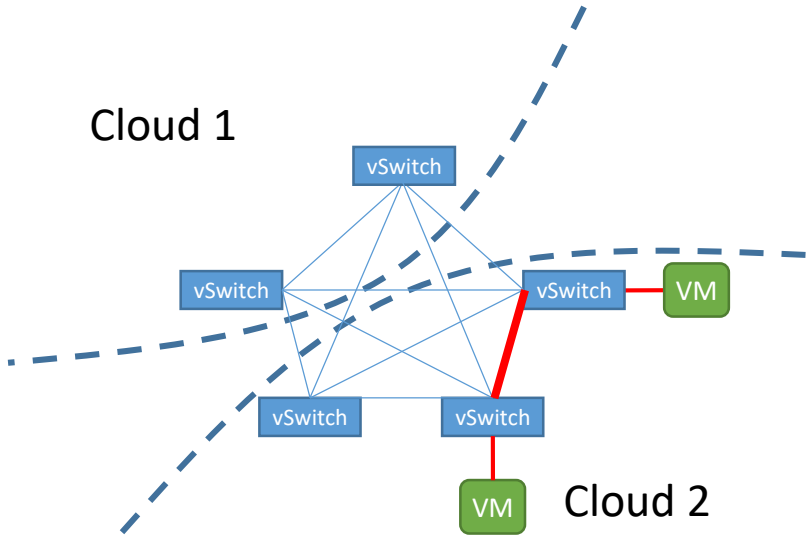
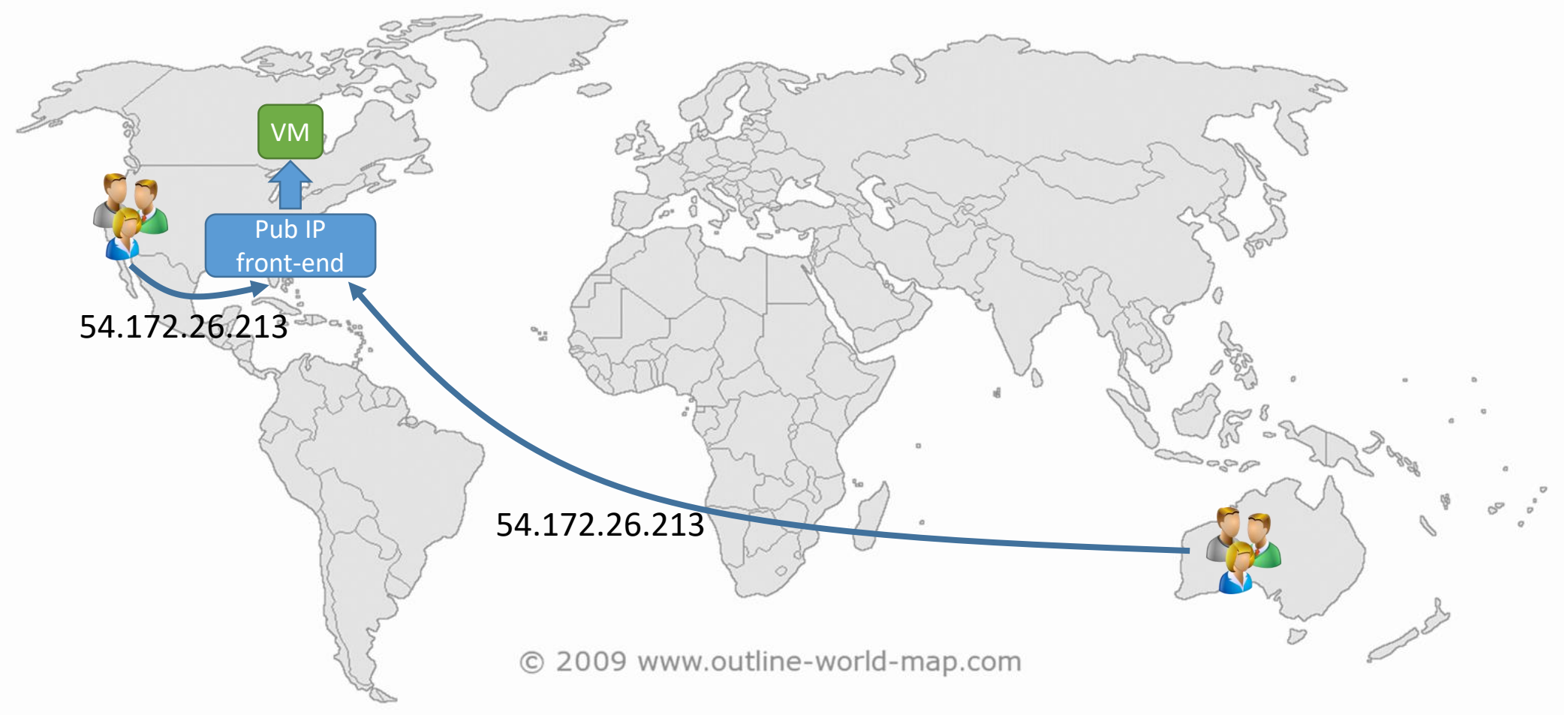


VM Migration with Public IP Address



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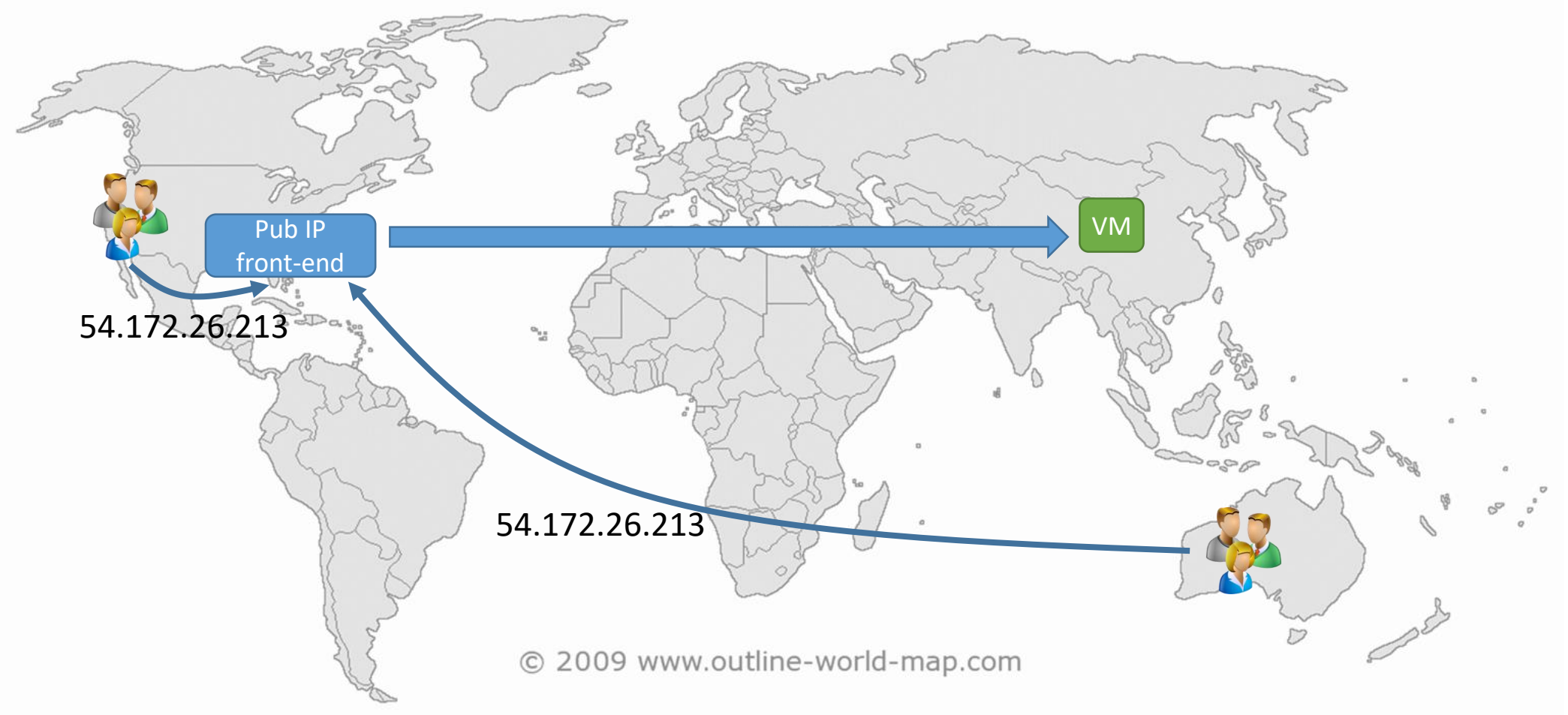

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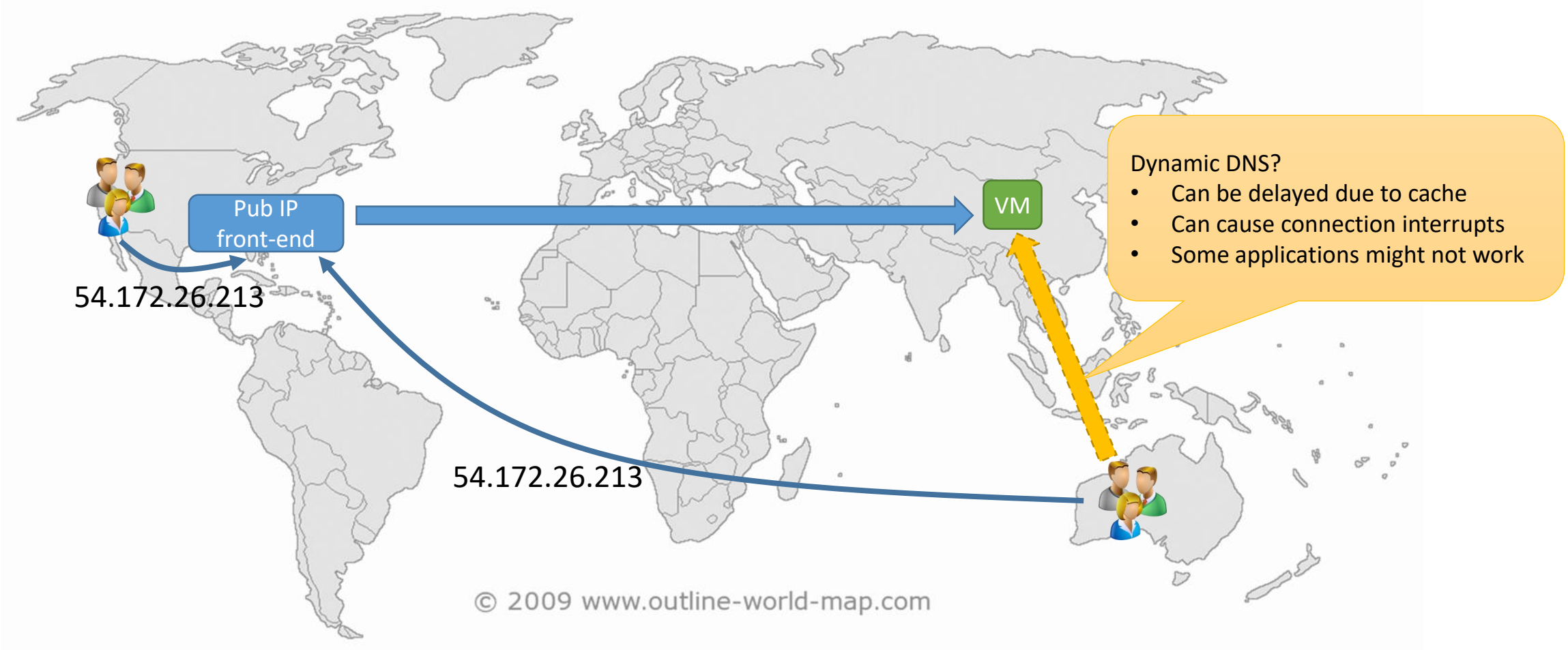

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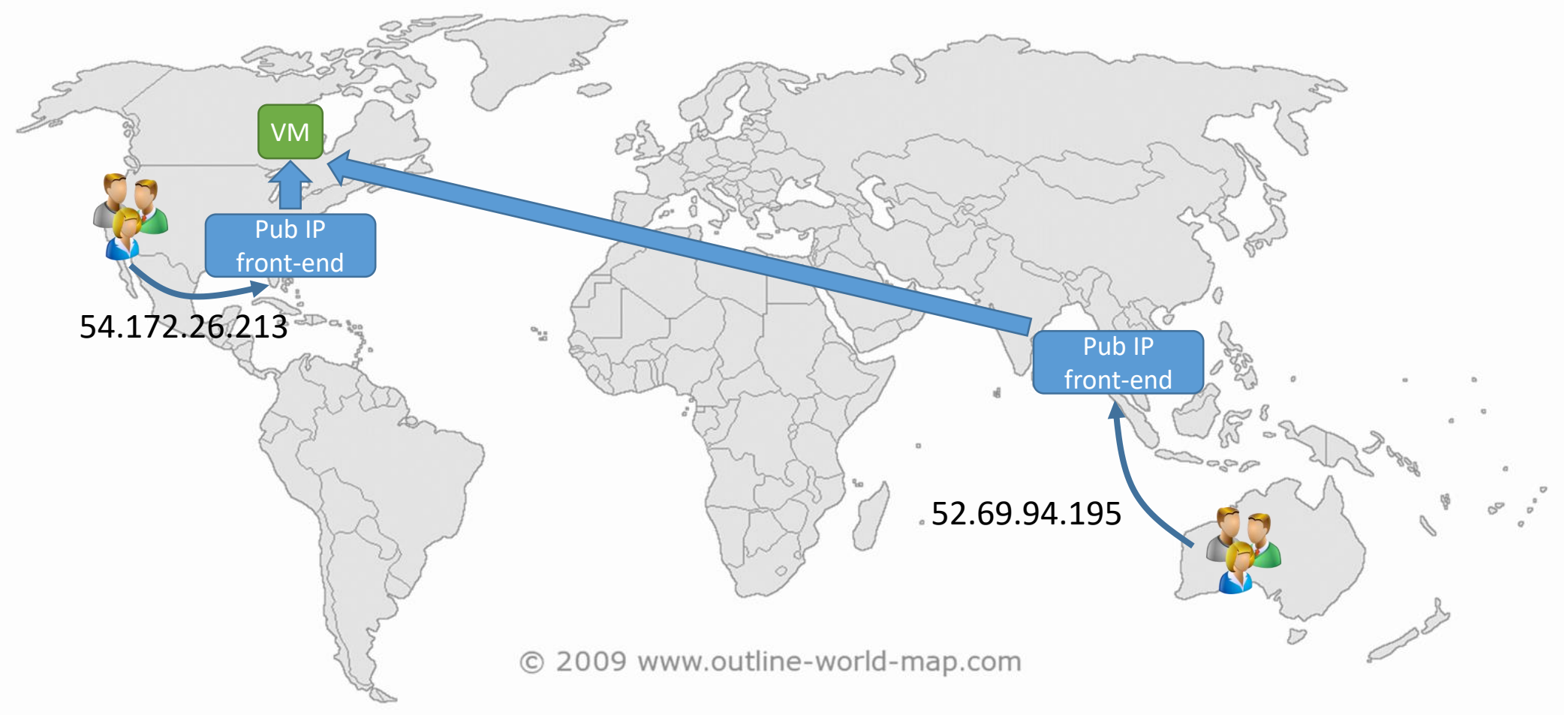

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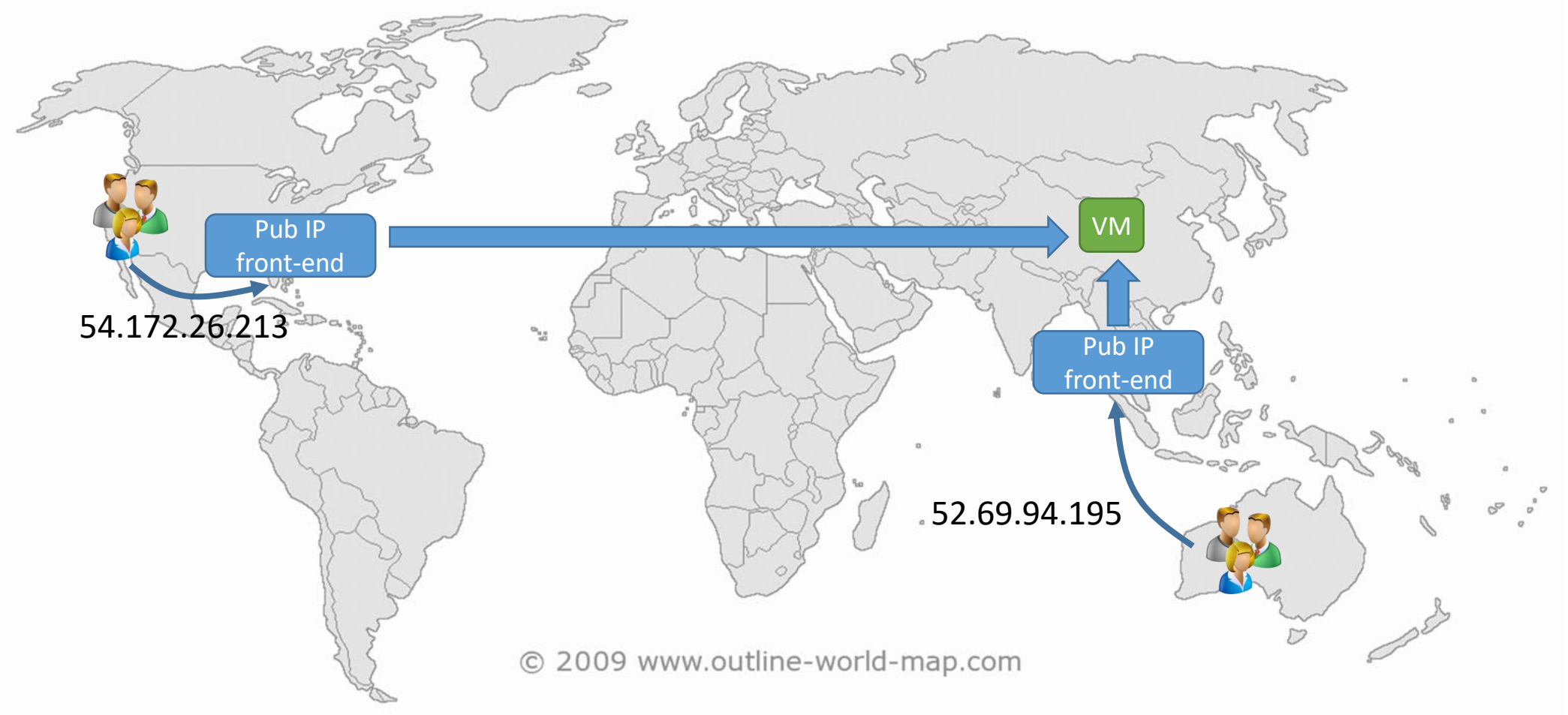
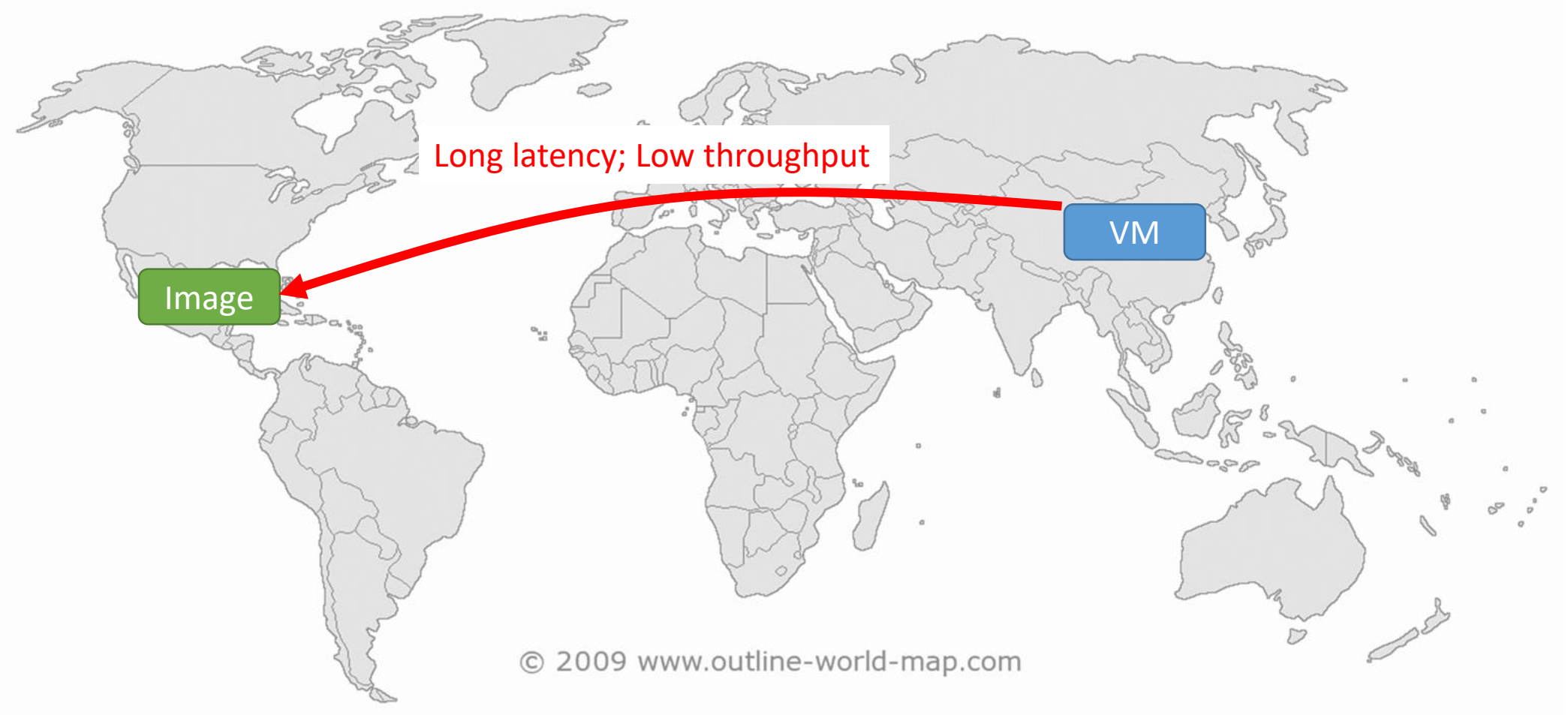


Centralized VM Image Storage



Geo-Replicated VM Image Storage

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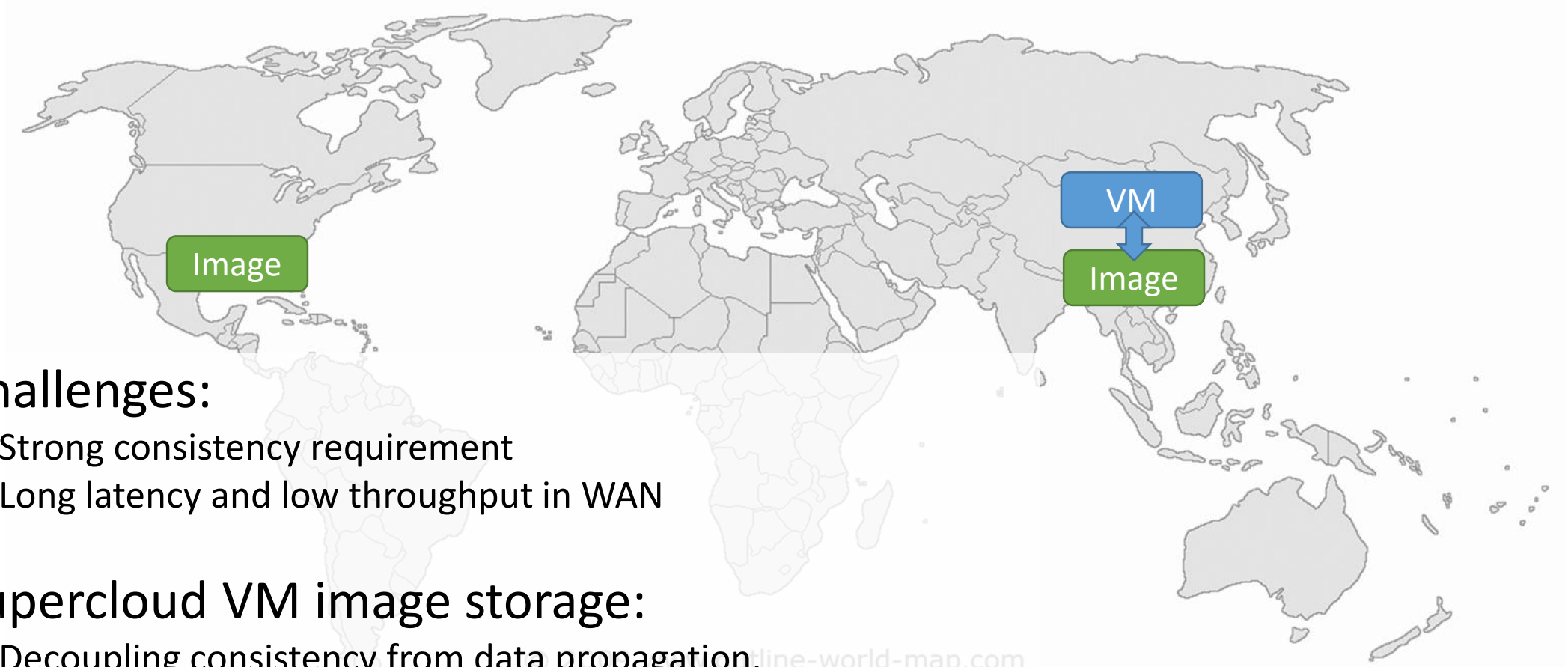


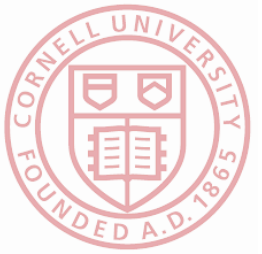
Challenges:

- Strong consistency requirement
- Long latency and low throughput in WAN

Supercloud VM image storage:

- Decoupling consistency from data propagation.
- Propagating data according to disk access patterns.

In the Paper



- Comparison with application-level migration
- Placement policies for different types of applications
- Detail design of the image storage
- Hierarchical network topology
- Evaluations

Conclusion

- Supercloud: application migration for geographically shifting workloads
  - Crossing heterogeneous cloud providers
  - Automatic placement and migration
  - Geo-replicated image storage
  - Wide-area SDN
- A unified private cloud that spans all clouds
- Controlled by the user!

- More at http://supercloud.cs.cornell.edu

Thank You.
Questions?